

IN THE CLAIMS:

Please amend the claims as follows:

- 1 1. (Withdrawn) In a magnetic read head having an air bearing surface
2 (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense
3 circuitry for detecting changes in electrical resistance within the sensor, the
4 sensor comprising:
5 a MTJ stack with an active region disposed at the ABS and having two opposite sides
6 each disposed generally orthogonally to the ABS, the MTJ stack comprising:
7 an antiferromagnetic (AFM) layer spanning the active region,
8 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,
9 a free layer of FM material spanning the active region and extending beyond
10 each of the two opposite sides thereof, and
11 a tunnel junction layer of electrically nonconductive material disposed between
12 the pinned layer and the free layer in the active region; and
13 a longitudinal bias layer formed on and in contact with the free layer outside of
14 the active region for biasing the magnetic moment of the free layer in
15 substantially a predetermined direction in the absence of an external magnetic
16 field.
2. (Cancelled)
3. (Cancelled)
4. (Cancelled)

HIT1P161A/SJ09-2000-0096US5

- 3 -

5. (Cancelled)

6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Cancelled)

1 10. (Withdrawn) sensor of claim 1 wherein the longitudinal bias layer comprises an
2 electrically nonconductive HM material disposed outside of the active region and in
3 abutting contact with the two opposite sides of the active region.

1 11. (Withdrawn) A direct access storage device (DASD) comprising:
2 a magnetic recording disk having at least one surface for storing magnetically
3 recorded data;
4 a magnetic read head having an air bearing surface (ABS) disposed for reading
5 the data from the magnetic recording disk surface;
6 in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:
7 a MTJ stack with an active region disposed at the ABS and having two
8 opposite sides each disposed generally orthogonally to the ABS, the MTJ
9 stack comprising:
10 an antiferromagnetic (AFM) layer spanning the active region,
11 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,
12 a free layer of FM material spanning the active region and extending beyond each of
13 the two opposite sides thereof, and

14 a tunnel junction layer of electrically nonconductive material disposed between the
15 pinned layer and the free layer in the active region; and

16 a longitudinal bias layer formed on and in contact with the free layer outside of
17 the active region for biasing the magnetic moment of the free layer in substantially a
18 predetermined direction in the absence of an external magnetic field;

19 an actuator for moving the magnetic read head across the magnetic recording
20 disk surface to access the data stored thereon; and

21 a data channel having sense circuitry coupled electrically to the MTJ sensor for
22 detecting changes in resistance of the MTJ sensor caused by rotation of the magnetic
23 moment of the free ferromagnetic layer relative to the fixed magnetic moment of the
24 pinned layer responsive to magnetic fields representing the data stored on the magnet
25 recording disk surface.

12. (Cancelled)

13. (Cancelled)

14. (Cancelled)

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

19. (Cancelled)

1 20. (Withdrawn) The DASD of claim 11 wherein the longitudinal bias layer
2 comprises an electrically nonconductive AFM material disposed outside of the
3 active region and in abutting contact with the two opposite sides of the active
4 region.

1 21. (Currently Amended) In a magnetic read head having an air bearing
2 surface (ABS), a magnetic tunnel junction (MTJ) sensor for connection to sense
3 circuitry for detecting changes in electrical resistance within the sensor, the
4 sensor comprising:

5 first and second electrically conductive leads;

6 a MTJ stack sandwiched between the first and second electrically
7 conductive leads with an active region disposed at the ABS and
8 having two opposite sides each disposed generally orthogonally
9 to the ABS, the first and second electrically conductive leads
10 extending laterally beyond the active region, the MTJ stack
11 comprising:

12 an antiferromagnetic (AFM) layer spanning the active region,
13 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

14 a free layer of FM material spanning the active region, and
15 a tunnel junction layer of electrically nonconductive material disposed between
16 the pinned layer and the free layer in the active region; and

17 a nonconductive longitudinal bias layer formed outside of the active region and
18 in abutting contact with the two opposite sides of the active region for biasing
19 the magnetic moment of the free layer in substantially a predetermined direction
20 in the absence of an external magnetic field, the longitudinal bias layer
21 ~~consisting of a layer of electrically insulating hard magnetic material~~ comprising

22 a layer of nickel-oxide extending from the first shield lead to the second lead
23 shield.

1 22. (Cancelled)

1 23. (Currently Amended) A direct access storage device (DASD)
2 comprising:

3 a magnetic recording disk having at least one surface for storing magnetically
4 recorded data;

5 a magnetic read head having an air bearing surface (ABS) disposed for reading
6 the data from the magnetic recording disk surface;

7 in the magnetic read head, a magnetic tunnel junction (MTJ) sensor comprising:
8 first and second electrically conductive leads;

9 a MTJ stack, sandwiched between the first and second electrically conductive
10 leads, with an active region disposed at the ABS and having two opposite sides
11 each disposed generally orthogonally to the ABS, the first and second
12 electrically conductive leads extending laterally beyond the active region, the
13 MTJ stack comprising:

14 an antiferromagnetic (AFM) layer spanning the active region,
15 a pinned layer of ferromagnetic (FM) material in contact with the AFM layer,

16 a free layer of FM material spanning the active region, and
17 a tunnel junction layer of electrically nonconductive material disposed between the
18 pinned layer and the free layer in the active region; and

19 a nonconductive longitudinal bias layer formed outside of the active region and in
20 abutting contact with the two opposite sides of the active region for biasing the
21 magnetic moment of the free layer in substantially a predetermined direction in the
22 absence of an external magnetic field, the longitudinal bias layer consisting of a

23 ~~layer of electrically insulating hard magnetic material comprising a layer of nickel-~~
24 ~~oxide~~ extending from the first lead shield to the second lead shield;
25 an actuator for moving the magnetic read head across the magnetic recording
26 disk surface to access the data stored thereon; and
27 a data channel having sense circuitry coupled electrically to the MTJ sensor for
28 detecting changes in resistance of the MTJ sensor caused by rotation of the
29 magnetic moment of the free ferromagnetic layer relative to the fixed magnetic
30 moment of the pinned layer responsive to magnetic fields representing the data
31 stored on the magnetic recording disk surface.

1 24. (Cancelled)

25. (Cancelled)

26. (Cancelled)

27. (Cancelled)

28. (Cancelled)

29. (Cancelled)

30. (Cancelled)

31. (Cancelled)

32. (Cancelled)

33. (Cancelled)

34. (Cancelled)

35. (Cancelled)

36. (Cancelled)

37. (Cancelled)

38. (Cancelled)

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Cancelled)

44. (Cancelled)

45. (Cancelled)

46. (Cancelled)

HIT1P161A/SJ09-2000-0096US5

- 9 -